Mitt. Bayer. Staatsslg. Paläont. hist. Geol.	28	23–32	München, 15. 12. 1988

Cuneolina pavonia compressa n. ssp. (Foraminifera; Upper Cretaceous, Northern Calcareous Alps) and the palaeogeographic relationship between the Gosau Beds and the Branderfleck Formation

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With 2 figures and 2 plates

Kurzfassung

Die neue Foraminifere *Cuneolina pavonia compressa* n. ssp. wird aus Turon/Coniac-Olistholithen von der Typlokalität der Branderfleck-Schichten in den Hohenschwangauer Alpen beschrieben. Die Abgrenzung zu den anderen Kreide-Cuneolinen wird ausführlich diskutiert.

Die betreffenden Olistholithe werden als resedimentierte Flachwasser-Gosau interpretiert.

Abstract

The new foraminifera *Cuneolina pavonia compressa* n. ssp. is described from Turonian/Coniacian-olistoliths of the type locality of the Branderfleck Formation in the Hohenschwangau Alps. The distinction to the other Cretaceous Cuneolinas is discussed in detail.

The olistoliths in question are interpreted as resedimented shallow water Gosau.

Inhalt

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Introduction: Geographical and geological setting

The type locality of the Branderfleck Formation, introduced by Gaupp (1980), is situated at the Branderschrofen E'Castle Neuschwanstein in the Hohenschwangau Alps.

This classic section, located at the northern part of the Lechtal nappe, was studied in detail by Gaupp (1980) and Weidich (1984a). According to the latter author the section ranges stratigraphically from lower Cenomanian to lower Santonian.

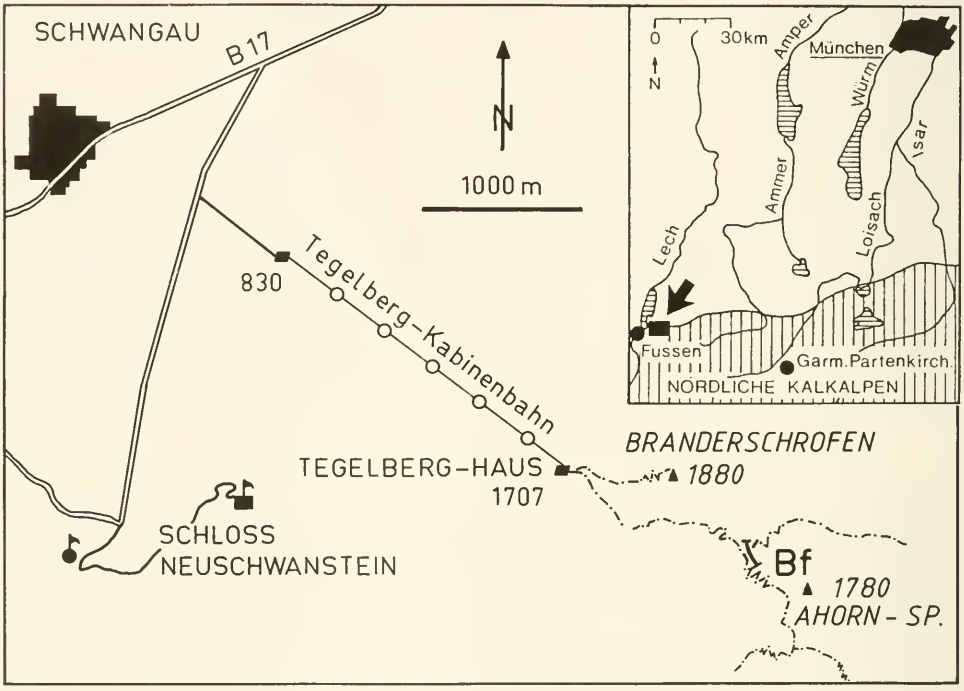

Fig. 1: Location map of the type section (BF) of the Branderfleck Formation. (After Weidich 1984b)

In the middle part of the profile an olistostrome, up to 20 meters thick, appears intercalated in marls with Coniacian age. It is poorly sorted (pebble to boulder size), matrix supported and consists almost solely of clasts of Turonian and/or Coniacian shallow water limestones. This stratigraphic determination is indicated by the very rare occurrence of the planktonic foraminifers *Dicarinella imbricata* (Mornod) and *Marginotruncana tricarinata* (Quereau) in some of the olistoliths. In addition some lower Cenomanian orbitolinid sandstone with *Orbitolina (Mesorb.) aperta* (Erman), *Orbitolina (Orb.)* gr. *concava* (Lamarck) and *Orbitolina (Conicorb.) conica* (d'Archiac) can seldom be found. Urgonian limestones are missing. The Turonian and/or Coniacian olistoliths are characterized by their high content of corals, rudistids (radiolitids and hippuritids) and coralline algae. The facies comprise coral-red algae framestones, bioclastic grainstones and rudstones. Not so frequent are foraminiferal wackestones without reef derived debris. They contain the new foraminifera discovered, that will be described below.

Systematic description

The systematic followed herewith is that of Loeblich & Tappan (1984).

Order Foraminiferida Eichwald, 1830
Suborder Textulariina Delage & Hérouard, 1896
Superfamily Ataxophragmiacea Schwager, 1877
Family Cuneolinidae Saidova, 1981, emend. Brönnimann et al. 1983
Subfamily Cuneolininae Saidova, 1981, emend. Brönnimann et al. 1983
Genus *Cuneolina* d'Orbigny, 1839
Species *Cuneolina pavonia* d'Orbigny, 1839

Cuneolina pavonia compressa n. ssp.
(Plate 1, Figs. 1–11)

Holotype: The specimen figured in Plate 1, Fig. 6.

Derivatio nominis: The name derives from the strong compression in the plane of biseriality.

Locus typicus: Type section of the Branderfleck Formation, E'Castle Neuschwanstein/ Hohenschwangau Alps. TK 25, No. 8430 Füssen, R 4409240, H 5269240.

Stratum typicum: Coniacian

Material: 6 thin sections, housed in the Bayerische Staatssammlung für Paläontologie und historische Geologie (Nr. G 4138–4188a/88).

Diagnosis: A new subspecies of *Cuneolina pavonia* d'Orbigny with the following special features: Test small, triangular, quiete rarely flabelliform, strongly compressed in the plane of

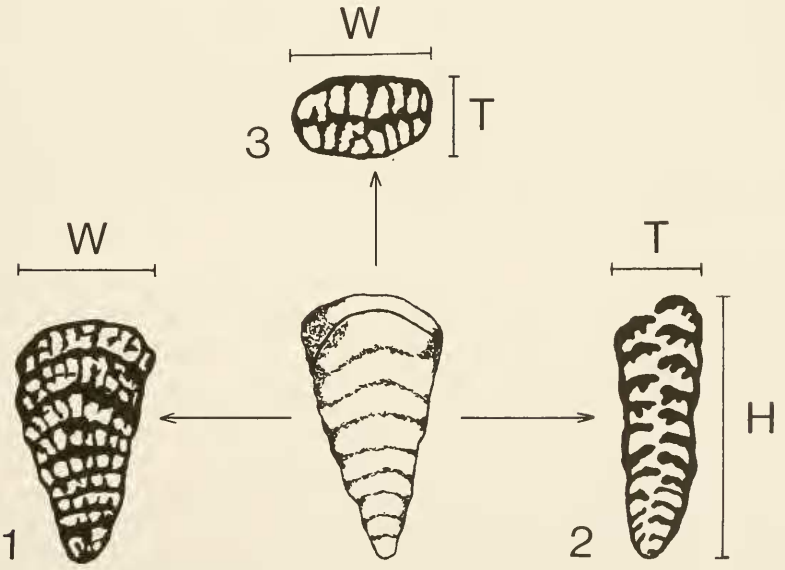

Fig. 2: Morphology and dimensions of *Cuneolina*. 1. Transversal section 2. Axial section 3. Median or equatorial section. W = Width, H = Height, T = Thickness.

biseriality. Septa and radial partitions thin; secondary structural elements only slightly developed.

Description: Test calcareous, imperforate, microgranular; no agglutinated foreign elements could be evidenced. The general shape is triangular with a convex base and an apical angle varying from 30° to 60°; flabelliform tests are seldom. The megalospheric form starts with a globular, excentric proloculus, about 0,7 mm in diameter, followed by 4 to 5 chambers arranged in a small spire (Pl. 1, Fig. 6). The remaining 8 to 20 chambers are arranged biserially displayed in axial sections (Pl. 1, Figs. 4–7, 10–11).

No observations could be made about the initial part of the microspheric generation.

The extremely compressed chambers are divided by radial partitions (8 to 10 in the last chamber) into broadly rectangular chamberlets (e. g. Pl. 1, Fig. 1). The septa and radial partitions equal in thickness. In the adult chambers one single, very fine, horizontal and vertical, sub-epidermal partition is present. The latter is incomplete and extends about 1/4th into the lumina (Pl. 1, Figs 1 and 3).

Measurements: (in mm)

Height:	0,39–0,7
Width:	0,41–0,8
Thickness:	0,11–0,16
Thickness of radial partitions:	0,01–0,015
Distance between radial partitions:	0,03–0,04
Thickness of septa:	0,01–0,017
Height of adult chamberlets:	0,07–0,09

Comparisons with other Cretaceous Cuneolinas

Considering the lower Cretaceous representatives, *C. tenuis* Velić & Gušić from the Valanginian of the Dinarides resembles foremost *C. pavonia compressa*. This small Cuneolina has thin walls and septa, too, but, on the other hand, does not develop secondary partitions. Apart from the differences in the internal structure, the thickness of the radial partitions in *C. tenuis* is less (0,0025–0,03 mm) and the test is slightly thicker (0,013–0,2 mm).

Both, *C.* gr. *laurentii – camposaurii* Sartoni & Crescenti as well as *C. hensoni* Dalbiez, are widely recorded from Hauterivian to Aptian/Albian strata in the mediterranean realm. These represent Cuneolinas with massive, thick septa and radial partitions. According to Sartoni & Crescenti (1962) the thickness of *C. laurentii* is 0,16 to 0,32 mm and 0,26 to 0,46 mm for *C. camposaurii*.

Besides the internal structures, *C. hensoni* on the other hand, can easily be distinguished from *C. pavonia compressa* in having a much larger test and chamberlets being narrowly rectangular. The specimens of *C.* gr. *laurentii – camposaurii* and *C. hensoni* figured in this paper were found in allochthonous Urgonian limestones with Aptian age that occur as components in upper Cretaceous Gosau conglomerates (Schlagintweit 1987). A further lower Cretaceous Cuneolina is *C. axinoides* from Barremian and lower Aptian Urgonian limestones of southern France. It differs from the new subspecies in being strikingly larger: height: 0,8 to 1,6 mm, width: 0,5 to 1,375 mm and thickness: 0,2 to 0,375 mm (according to Arnaud-Vanneau 1980).

From upper Cretaceous strata *C. pavonia* d'Orbigny, *C. conica* d'Orbigny, *C. fleuriausiana* d'Orbigny, *C. pavonia parva* Henson and *C. cylindrica* Henson are known. The first three species, possessing the same internal structure, solely differ in size and shape of the test (Henson 1947: 44). As stated by Saint-Marc (1974: 220) there are all kinds of intermediate forms be-

tween them and, therefore, were regarded synonymous by Cushman (1937: 69). Tronchetti (1981: 77) assembles the different forms in the group of *C. pavonia* d'Orbigny, the type-species, because of the extreme polymorphism. This seems to be practical until the outstanding and necessary revision of the different species has been carried out. *C. cylindrica* Henson from the Maastrichtian of Iraq is acutely triangular (apical angle 7 to 14°), almost cylindrical in early stages and thus does not show any similarities with the new subspecies of *C. pavonia.*

Both, *C. pavonia* d'Orbigny and the smaller subspecies *C. pavonia parva* Henson represent high-developed, large (up to several mm) Cuneolinas with several series of secondary partitions that produce a meshwork of small chamberlets. In Henson's specimen of *C. pavonia parva* figured in plate 12, Fig. 2 two to three horizontal plates can be recognized in the latest chambers. The thickness of the test varies from 0,2 to 0,3 mm, thus easily distinguishable from the subspecies *compressa.* The figured specimens of *C.* cf. *pavonia parva* were found in *Halimeda*-bearing biosparites at the type section of the Branderfleck Formation.

Nothing can be said about the relationship to *C. pavonia angusta* Cushman, a large form (length up to 5 mm or more) from the Miocene Bowden marl of Jamaica, because only external views have been figured.

Although there is a lot of confusion concerning the upper Cretaceous Cuneolinas, *C. pavonia compressa* differs from all the other Cretaceous Cuneolinas by its small thickness. Because of this feature it can be easily recognized in axial as well as in transversal sections. Because of the dimensions and the slightly developed secondary structural elements *C. pavonia compressa* can be regarded as primitive in comparison with the other upper Cretaceous representatives. The phylogenetic relationship of the different species is beyond the scope of the present paper.

Facies and stratigraphy

C. pavonia compressa was found in foraminiferal wackestones with a typical miliolid-textulariid assemblage. The fauna includes:

Montcharmontia apenninica compressa (de Castro)
Nezzazatinella cf. *picardi* (Henson)
Dictyopsella kiliani Schlumberger
Vidalina hispanica Schlumberger
Nummoloculina sp.
Quinqueloculina sp.
Rupertianella sp.
Spiroloculina sp.
Lituolidae gen. et sp. indet

Up to now *C. pavonia compressa* has been found only in the mentioned olistoliths with Turonian and/or Coniacian age.

Palaeogeographic implications

According to Gaupp (1980: 224, Fig. 96, 227, 252, Fig. 100) the distributary province of the olistoliths in question was located north off the Calcareous Alps, although recognizing similarities with the shallow water Gosau. In contrast Weidich (1985: 244) states that they might derive from southern directions, based on observations made in the area of the lower Inn valley (Weidich 1984b: Model of the Oberaudorf ridge).

Rocks with a comparable facies are exposed at the Pletzachalm Gosau (Sonnwend Mountains/Lechtal nappe), where Leiss (1987) described rudistid-buildups (radiolitids and hippuritids) with corals and calcareous algae. Comparing the microfacies and the occurring faunal and floral elements, striking similarities with the olistoliths of the Branderfleck Formation are clearly evident. There is, therefore, the conclusion that these olistoliths, loosing their exotic character, represent components of shallow water Gosau that have been resedimented and transported northwards to the Branderfleck Formation. Thus they cannot derive from the north. The fact that no Gosau Beds are known in the same meridian, south off the Branderschrofen, does not speak against this interpretation, because one has to keep in mind, that the present occurrences of Gosau Beds, being erosional relics only, don't coincide with the former distribution (Herm 1979: 97, 100).

As a further result it becomes more and more dubious that exotic pebbles could reach the Basal Gosau Beds from a distributary province north off the Calcareous Alps as has recently again been emphasized by Leiss (1987).

The observations made are a further proove for the stratigraphical and palaeogeographic relationship of the Gosau and the Branderfleck Formation as has been stressed by Weidich 1984a).

Acknowledgement

My thanks go to Dr. O. Leiss (Munich) who provided the samples from the Pletzachalm Gosau.

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Plate 1

Cuneolina pavonia compressa n. ssp.

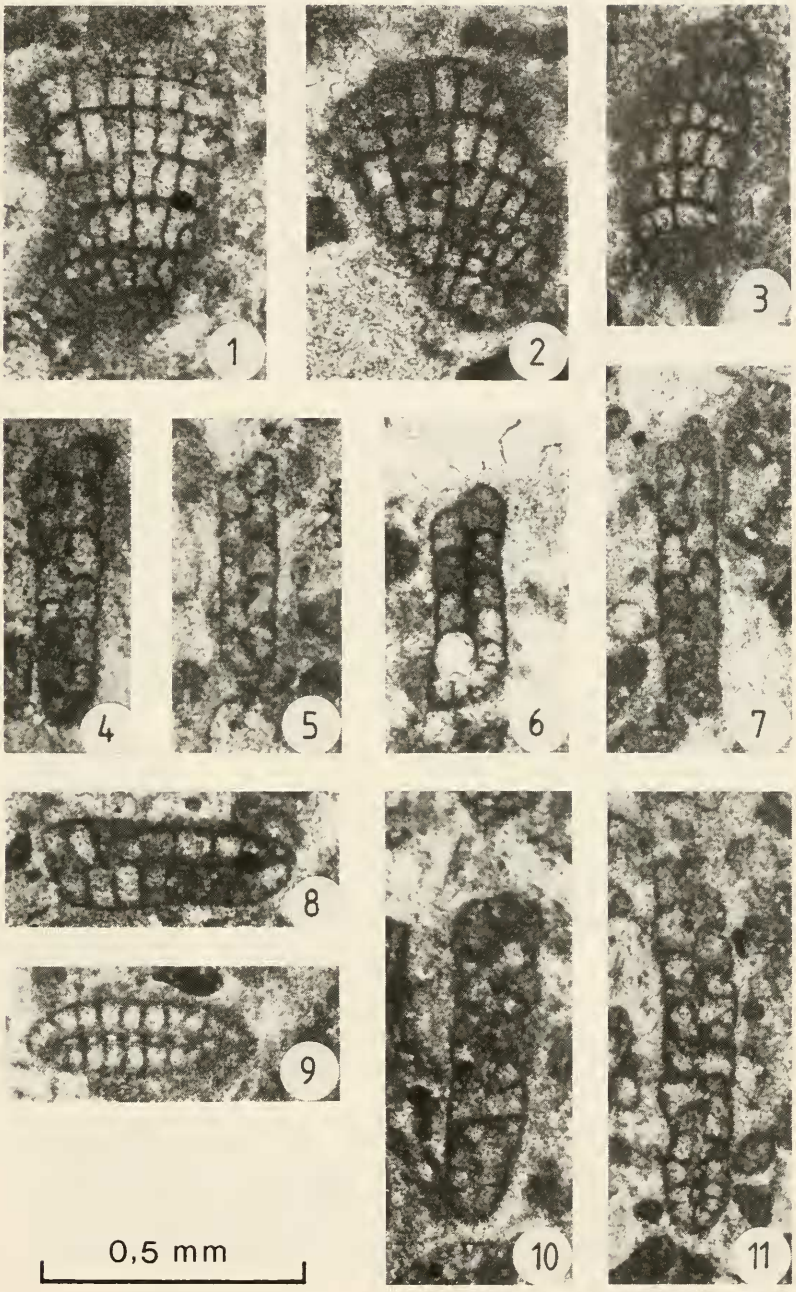
Fig. 1–3: Median sections. Thin sections G 4183, 4185 and 4186 a/88.
Figs 4–7: Axial sections. Thin sections G 4186–4188 a/88.
Figs 8–9: Transversal sections. Thin section G 4183 a/88.
Figs 10–11: Axial sections, oblique. Thin sections G 4185 and 4188 a/88.

Plate 2

Cretaceous Cuneolinas of the Northern Calcareous Alps.

Figs 1–4: *Cuneolina hensoni* DALBIEZ. Thin sections G 4189 – 4191 a/88.
Figs 5–6, 9: *Cuneolina* gr. *laurentii – camposaurii* SARTONI & CRESCENTI. Thin sections G 4115 and 4118 a/87.
Figs 7–8, 10–11: *Cuneolina* cf. *pavonia parva* HENSON. Thin sections G 4192–4193 a/88.

The thin sections are deposited at the Bayerische Staatssammlung für Paläontologie und historische Geologie, München.



SCHLAGINTWEIT, F.: *Cuneolina* **Plate 1**

SCHLAGINTWEIT, F.: *Cuneolina* **Plate 2**